

Generalizations are driven by semantics and
constrained by statistical preemption

New evidence from artificial language experiments

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Generalizing beyond the input

- Learning a language = generalizing beyond the input
- For instance, using verbs in novel ways

It meeked (witnessed form)

She meeked it (generalized form) (Naigles 1990; Fisher et al. 1991; Gertner et al. 2006; Fisher et al. 2010; Yuan et al. 2012; Akhtar 1999; Tomasello 2000)

- Overgeneralization errors (e.g., Bowerman 1990)

?? *Don't giggle me*

Generalizing beyond the input

- When and why do speakers generalize beyond their input? And when and why do they not?
- What aspects of the input are relevant?
 - Does language learning *only* consist of gleaning statistical regularities in the input?
 - What about the role of the *function* of constructions?

Artificial language learning studies

(e.g., Casenhiser & Goldberg 2004; Finley & Badecker 2009; Folia et al. 2010; Fedzechkina et al. 2010; Hudson Kam & Newport 2005; Wonnacott et al. 2008)

- Participants exposed to novel <utterance, video scene> pairs
- Statistical structure of input is manipulated
- To test the role of statistics in language learning

Experiment 1

- Two word order constructions: APV and PAV, a suffix $-po$ on the patient argument

the panda the pig- po mooped (APV: Agent Patient- po Verb)

the pig- po the panda mooped (PAV: Patient- po Agent Verb)

‘the panda mooped the pig’

- Six novel verbs (e.g., *glim*, *moop*, *wub*) referring to transitive actions (e.g., ‘punch’, ‘push’, ‘head-butt’)
- Two test conditions
 - Lexicalist: **3** APV-only verbs, **3** PAV-only verbs
 - Alternating: **2** APV-only, **2** PAV-only, **2** alternating verbs

Experiment 1

- Constructions are rarely synonymous in natural languages (cf. Bolinger 1968; Givon 1979; Goldberg 1995)
- Our two constructions differ in the intensity of the effect on the patient
 - **APV**: strong effect: the patient rapidly moves across the screen and out of the scene with dramatic gestures
 - **PAV**: weak effect: the patient hardly moves, with similar but less ample gestures

Example of APV exposure pair



the monkey the panda-*p*₀ glimmed

Example of PAV exposure pair



the panda-*po* the monkey glimmed

- Participants: 24 Princeton undergraduates (18-22, 16 female)
- Exposure (2 days)
 - 36 sentence-scene pairs, each verb used 6 times
 - Participants were asked to repeat each sentence
- Sentence production task
 - Participants described new scenes; verb was given
 - Each of the 6 verbs presented 4x, twice each with video showing strong and weak effect
 - Two new novel verbs, not witnessed in the input

Example of production trial (strong effect)



what happened here?

(pilked)

the pig the cat-*po* pilked

or

the cat-*po* the pig pilked

Example of production trial (weak effect)



what happened here?

(pilked)

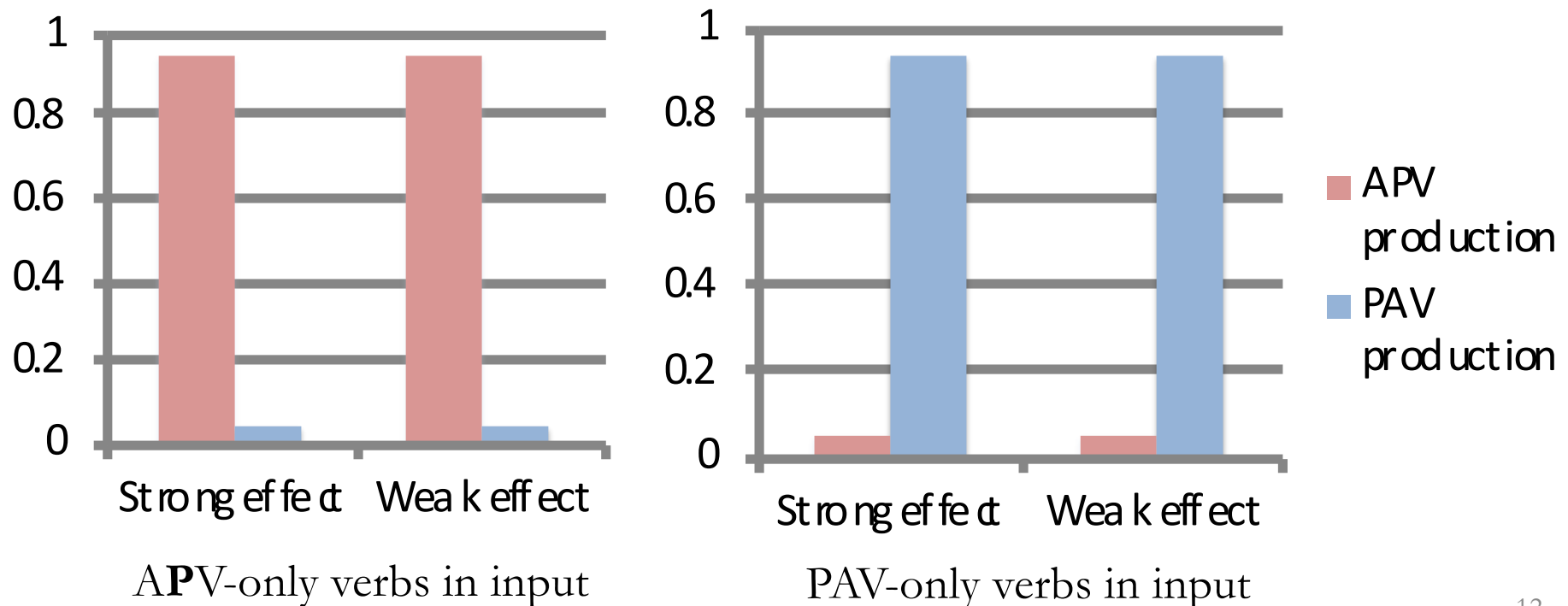
the pig the cat-*po* pilked

or

the cat-*po* the pig pilked

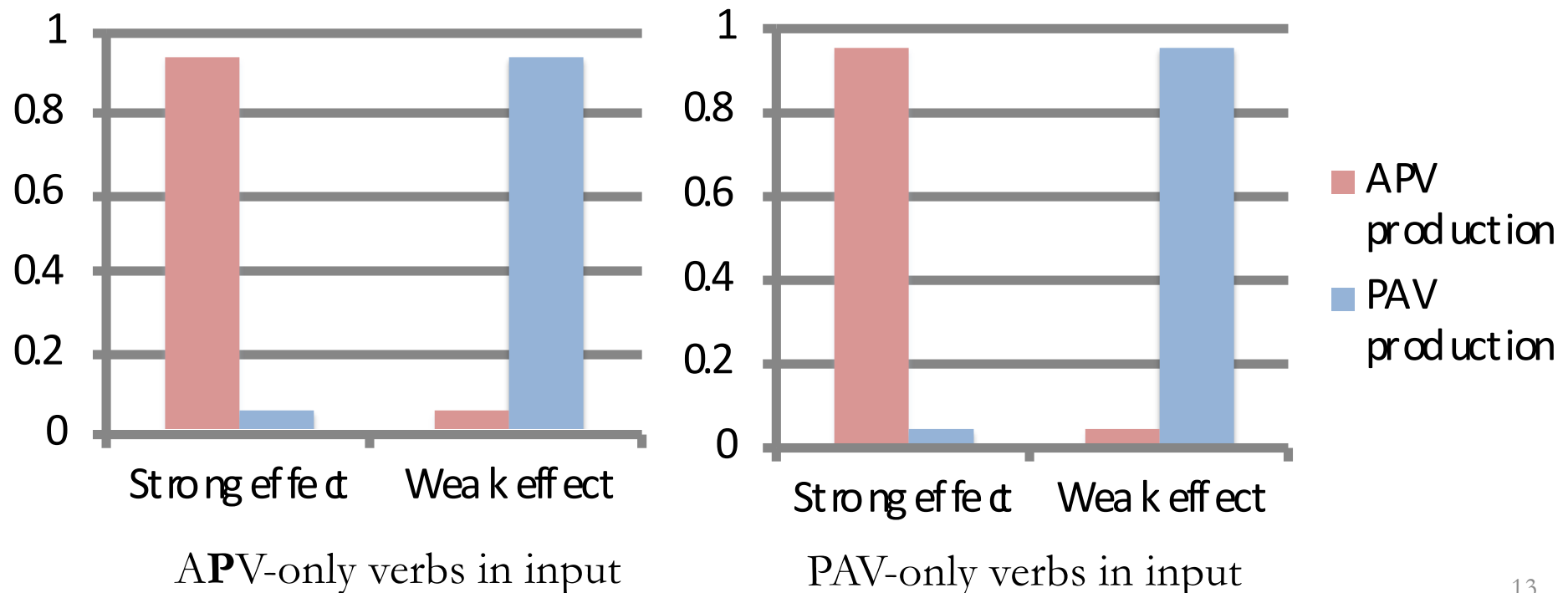
To what extent do speakers generalize constructions to unattested verbs?

- Hypothetical data: conservative, verb-based behavior

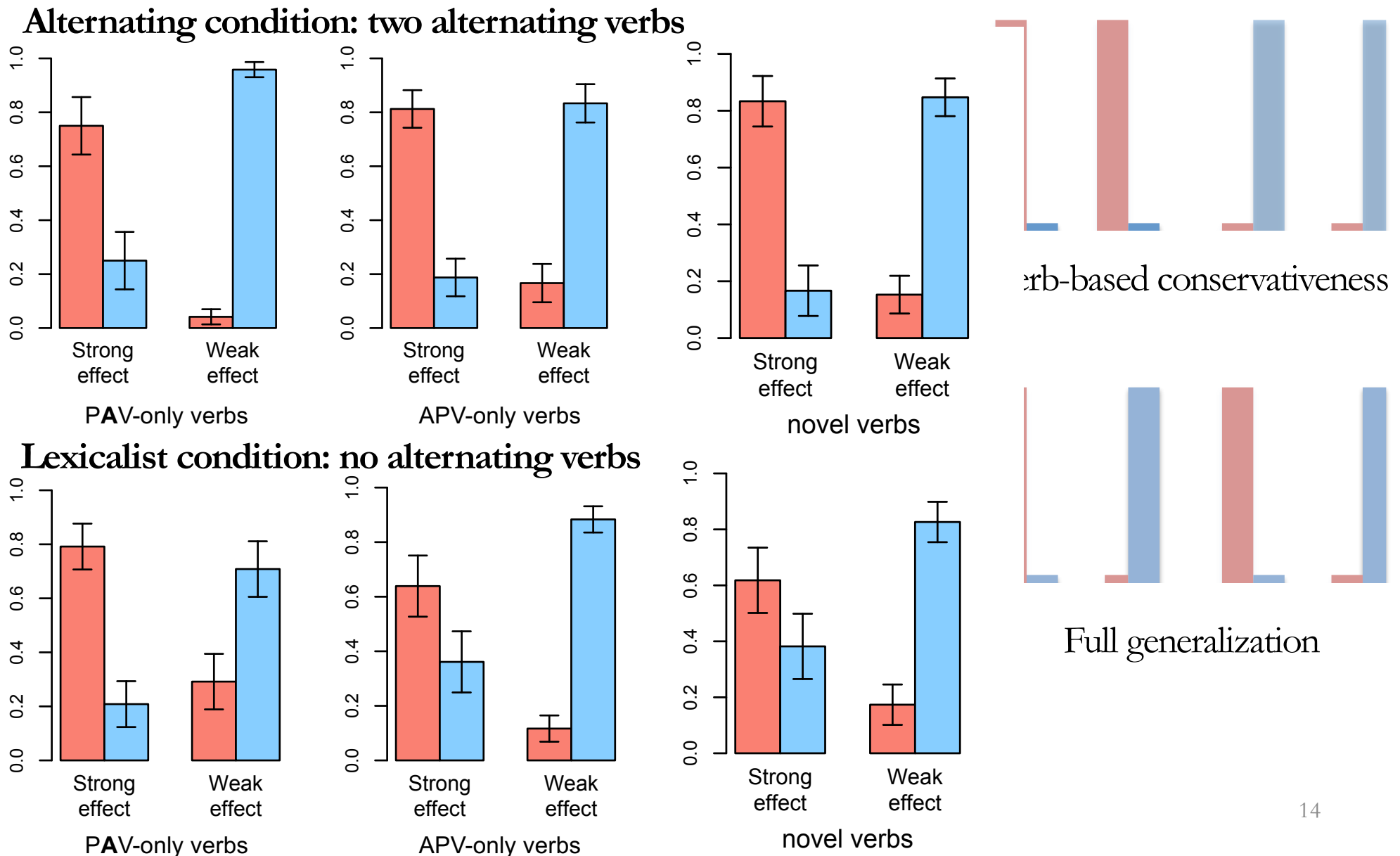


To what extent do speakers generalize constructions to unattested verbs?

- Hypothetical data: full generalization across verbs



Experiment 1: Results



Mixed effects logistic regression

(to predict the probability of producing APV)

- Strong tendency to produce APV when the effect is strong ($\beta = 3.4756$, $p < 0.0001$)
- **APV**-only verbs tend to be used (slightly) more often with APV compared to novel verbs ($\beta = 0.8111$, $p = 0.0013$)
- Interaction between Condition and Effect: the effect of the functional difference is weaker in the lexicalist condition ($\beta = -1.1113$, $p = 0.0085$)

Summary of Experiment 1

- Tendency for participants to generalize (using verbs in the contextually appropriate constructions)
- They may ignore usage of individual verbs
- Linguistic function can overcome statistical information in the choice of construction
- Contrasts with Wonnacott et al.'s (2008) results with synonymous constructions; see also Perek & Goldberg (2015); Thothathiri & Rattinger (2016)

Discussion

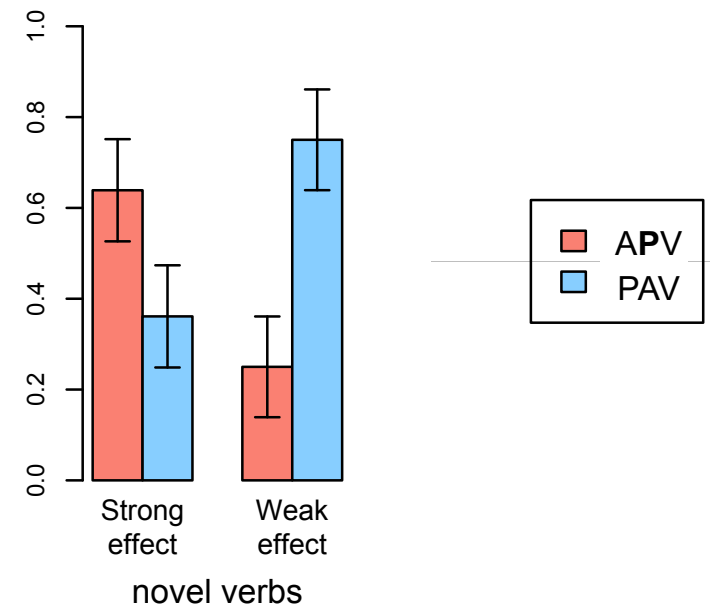
- The meaning of constructions is a source of productivity in natural language (e.g., Goldberg 1995)
- But constructional generalizations are typically restricted, e.g.,
**Explain me this. (Explain this to me)*
- **Statistical preemption:** (Goldberg 1995; Goldberg 2006, Boyd & Goldberg 2011; Robenalt & Goldberg 2015, 2016)

Repeated occurrence of a form A when a different form B is expected provides evidence that only A is acceptable

Experiment 2: statistical preemption

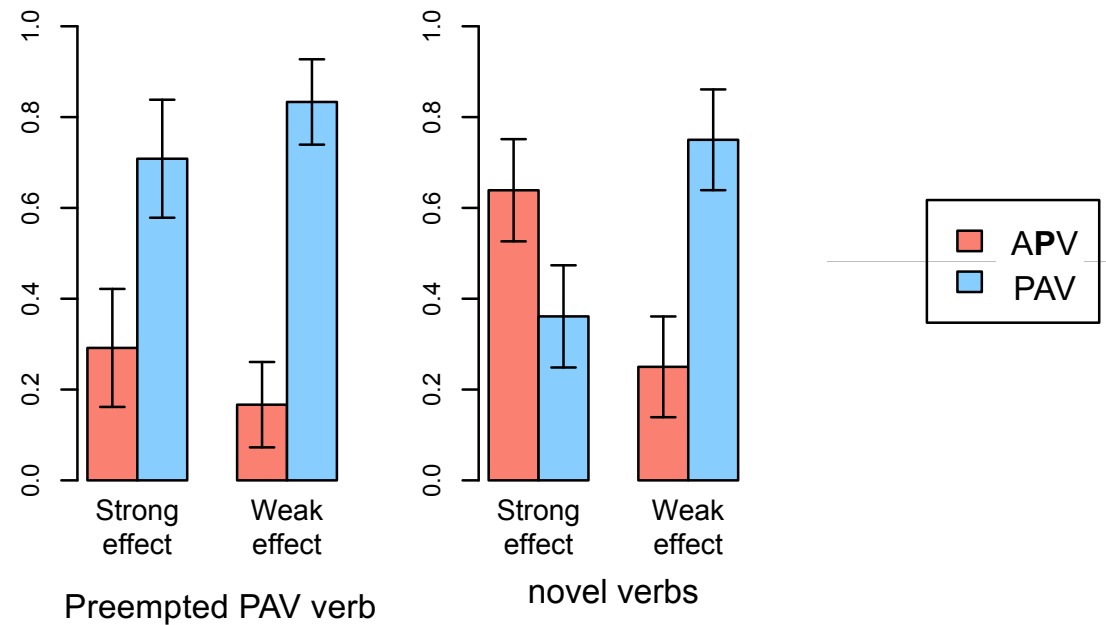
- Similar design to Experiment 1
- 1 PAV-only verb statistically preempted from **APV**
i.e., used with both strong and weak effect in PAV in exposure
- Will speakers only use the verb in PAV contexts, regardless of strength of effect?
- Will this affect the way they learn the language?

Experiment 2: Results



Novel verbs
tend to be used
with the
contextually
appropriate
construction

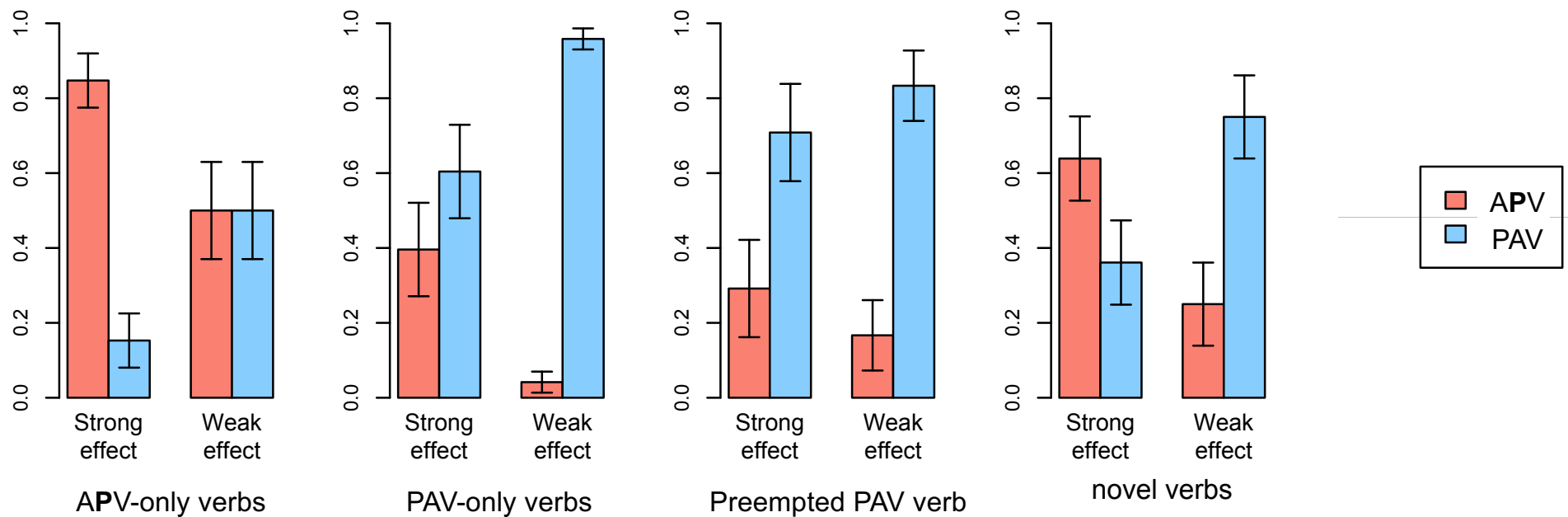
Experiment 2: Results



Preempted PAV verb tends to be used in PAV

Novel verbs tend to be used with the contextually appropriate construction

Experiment 2: Results



APV-only verbs tend to be used in APV in both contexts

PAV-only verbs tend to be used in PAV in both contexts

Preempted PAV verb tends to be used in PAV

Novel verbs tend to be used with the contextually appropriate construction

Mixed effects logistic regression

(to predict the probability of producing APV)

- Again, tendency to produce APV when the effect is strong ($\beta = 2.0433$, $p < 0.0001$)
- But mitigated by strong effects of VerbType: participants are more conservative with all verbs

APV-only: $\beta = 1.3727$, $p = 0.0002$

PAV-only: $\beta = -1.2858$, $p = 0.0013$

preempted PAV: $\beta = -1.4558$, $p = 0.0026$

Summary of Experiment 2

- Productions with the new novel verbs show speakers did learn the functional difference between constructions.
- Speakers are also very sensitive to preemptive information; they used it to infer the restriction on the preempted verb.
- They were also more lexically conservative with other verbs:
Unlike Exp. 1, **APV**-only and **PAV**-only verbs were mostly used with **APV** and **PAV**, respectively.
- → preemptive exposure for one verb provides evidence that other verbs, too, are restricted in their distributions

Conclusion

- Adult learners are sensitive to the form and function of newly learned constructions
 - Speakers are willing to generalize beyond their input according to the function of constructions
- They are also sensitive to the distribution of verbs
 - Statistical preemption provides evidence that verbs are restricted in their distributions

Thanks for your attention!

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